

**TRIGGER FOCUS GROUP
RECOMMENDATION #6
FLOW CALCULATIONS**

October 4, 2006

OBJECTIVE: The objective of this requirement is to obtain flow data at Coalition monitoring sites. Accurate flow measurements are particularly important to the Irrigated Lands Program at Coalition monitoring sites in order to assess the magnitude of waste discharged (instantaneous loads) to surface waters, and to evaluate the potential impact of detected pollutants from waterbodies of varying sizes and flows.

PROBLEM STATEMENT: The compliance monitoring section of the draft Coalition Group monitoring MRP states the following:

“Representative flow measurements shall be obtained at each sample location during each sampling event. Additionally, the presence or absence of flow at each sample site shall be noted at a sufficient frequency to determine the quantity discharged during the irrigation season. The MRP Plan shall record the time, date and location of each flow measurement or observation (absences) on field data sheets. Discharge flow monitoring shall be reported in cubic feet per second (cfs).”

Stream flow or discharge is defined as the rate at which a volume of water flows past a point over some unit of time (i.e, cubic feet per second). The major technical issue associated with this stream flow requirement is the number of flow measurements that can be taken at a stream site in order to accurately determine the flow. The USGS method is generally considered the most accurate method of determining flow at a site. This method requires taking numerous flow measurements (~ 20 for some sites with adequate stream width) at different depths and distances from the stream bank (Church et al. 1999). These measurements are generally taken in wadeable streams although sampling from bridges is also an option. It was estimated by Trigger Focus Group members (June 6, 2005 conference call) that for some Coalitions only 25% of the sites are wadeable and therefore appropriate for the USGS method. For other sites only a few flow measurements can be taken near the stream bank. In order to determine the uncertainty that would be associated with taking only a few flow measurements at a site, Mike Johnson (University of California Davis and Trigger Focus Group member) compared flow measurements from 8 randomly selected stream sites in the Central Valley using the USGS method and one to four flow measurements across the channel (Attachment A). Mike’s results using four different flow scenarios with four measurements or less showed that flow was statistically different (lower) for all cases when compared with the USGS method. In summary, using only a few flow measurements at a site cannot accurately determine flow.

FOCUS GROUP RECOMMENDATION:

When possible the USGS method should be used at all wadeable and nonwadeable stream sites for accurately determining flow. If the USGS method cannot be used then flow measurements should be taken near the stream bank of the site or the float method can be used (Harrington and Born, 2000). The approximate location and number of stream flow measurements should be documented on the data sheets. Photo documentation should also be used at these sites. Data files for flow data should contain a comment column that will allow a flag for flow measurements that have a high degree of uncertainty. Flow data with a high degree of uncertainty should not be used for pesticide (or other constituent) instantaneous loading calculations.

The Triggers Focus Group expects that the RWQCB staff will refine the flow data (and flow data quality) that they will need for regulatory needs under a separate activity.

REFERENCES

Church, P. E., G. E. Granato, and D. W. Owens. 1999. Basic requirements for collecting, documenting, and reporting precipitation and stormwater-flow measurements. United States Geological Survey. Report 99-255, Northborough, Massachusetts.

Harrington, J. and M. Born. 2000. Measuring the health of California streams and rivers – A methods manual for water resource professionals, citizen monitors and natural resource students. Report. Sustainable Land Stewardship International Institute, Sacramento, California.

Attachment A - Comparison of discharge calculations (in cfs)

		USGS-method	1st (1st intervall used for all)	2nd (2nd intervall used for all)	2/2 (2 most outer intervalls used)	1-3 (intervall 1-3 on one side used)
1	Site 1	3.97	0.56	1.11	3.11	1.45
2	Site 2	11.79	11.43	12.01	11.59	10.4
3	Site3	48.47	3.07	9.61	9.32	12.21
4	Site4	5.94	0	0	1.22	3.14
5	Site 5	41.56	13.71	32.74	15.19	35.94
6	Site 6	70.28	35.27	68.86	63.91	27.65
7	Site 7	44.05	0	17.93	19.97	16.04
8	Site 8	75.7	30.64	68.31	58.3	52.64

very small creek, USGS method
used only 5 intervals

p = 0.0075

p = 0.0519

p = 0.0205

p = 0.0198